AMENDMENTS TO THE DRAWINGS

This Amendment encloses a replacement drawing sheet which corrects Figures 5 and 7. Applicant respectfully requests withdrawal of this objection.

Attachments:

Replacement Sheet

Annotated Sheet Showing Changes

REMARKS

Claims 1-20 are all the claims presently pending in the application. Claims 1-14, and 16 are amended to more clearly define the invention and claims 17-20 are added. Claims 1 and 13-14 are independent.

These amendments are made only to more particularly point out the invention for the Examiner and not for narrowing the scope of the claims or for any reason related to a statutory requirement for patentability.

Applicant also notes that, notwithstanding any claim amendments herein or later during prosecution, Applicant's intent is to encompass equivalents of all claim elements.

Applicant gratefully acknowledges the Examiner's indication that claims 5-12 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. However, Applicant respectfully submits that all of the claims are allowable.

Claims 1-4 and 13-16 stand rejected under 35 U.S.C. § 102(b) as being anticipated by the Handel et al. reference.

This rejection is respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

An exemplary embodiment of the claimed invention, as defined by, for example, independent claim 1, is directed to a coating dry estimating method of estimating a dry state of coating on a coating target. The method includes calculating temperature data indicating transition of a temperature distribution of the coating target with time lapse, calculating an integrated value of an amount of heat applied to the coating based upon the calculated

temperature data of the coating target, and estimating the dry state of the coating based upon the calculated integrated value of the amount of heat.

Conventional coating dry estimating methods and systems have difficulty determining a drying time when the temperatures of a coating target are distributed unevenly across the target. These conventional methods and systems only estimate the temperature within a drying furnace and/or monitor a surface of a coating target. These conventional methods and systems do not provide an accurate method for determining drying time.

For example, a coating target such as a car body will have an uneven temperature distribution. The inside of the car body will oftentimes have a lower temperature than the outside of the car body. Thus, the drying time for the inside of the car body will be longer than the outside of the car body.

The present invention addresses this problem by calculating temperature data indicating a transition of a temperature distribution of the coating target with time lapse. In this manner, the temperature data provides the ability to determine the temperature distribution across a coating target, such as a car body, for example. This provides a tool with which the drying time for a coating that is applied onto the coating target may be accurately estimated.

Additionally, since conventional methods and systems are only capable of monitoring temperatures without regard to a temperature distribution, conventional systems are only capable of controlling the temperatures to follow a temperature profile. Thus, these conventional methods and systems have not recognized an important distinction between monitoring a temperature and monitoring an amount of heat applied to a coating.

The drying time for a coating may be estimated much more accurately when the

system is controlled based upon <u>the amount of heat that is applied to the coating</u> in comparison to conventional methods and systems which only control based upon <u>a temperature profile</u>.

In stark contrast to conventional methods and systems, using the temperature data, the present invention is capable of accurately <u>calculating an integrated value of an amount of heat applied to the coating</u>.

In other words, rather than monitoring the temperatures within a drying chamber and/or the temperature of a part within the drying chamber and <u>controlling those temperatures</u> such that they <u>follow a temperature profile</u>, the present invention is capable of controlling a system based upon <u>the amount of heat that is applied to the coating</u>. In this manner, the present invention provides methods and systems which much more accurately estimate the drying time for a coating on a coating target.

II. THE PRIOR ART REJECTION

The Examiner alleges that the Handel et al. reference teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by the Handel et al. reference.

The Handel et al. reference discloses a method of controlling the curing process of a fiber-reinforced thermosetting resin composite material. Specifically, the composite material placed in an autoclave is cured by heating in an autoclave. During this curing process, the temperature of both the autoclave and the material is repetitively measured in the predetermined cycle. Based on the material temperature measured on a certain timing, a degree of cure ALPHA, which indicates the cure condition of the material on this timing, is

calculated. The optimal autoclave temperature is calculated based on this calculated ALPHA, and the temperature of the autoclave is changed to the optimal autoclave temperature.

With respect to the degree of cure ALPHA, as described in column 13, lines 21-36 of the Handel et al. reference, ALPHA is determined based upon the predetermined function in which the material temperature T1 is input (ALPHA=F(T1)). And, as disclosed in Fig. 10, the optimal autoclave temperature is determined by the "yes" prong or the "no" prong depending on the value of ALPHA.

In stark contrast, the claimed invention is quite different from that which is disclosed by the Handel et al. reference. In particular, the claimed "dry state" does not correspond to the ALPHA that is disclosed by the Handel et al. reference. Claim 1 recites "calculating an integrated value of an amount of heat applied to the coating on a basis of the temperature data" and "estimating a dry state of the coating on a basis of the integrated value of the amount of heat." These claimed limitations indicate that "a dry state" is estimated on the basis of <u>**the integrated value of the amount of heat**</u>. In this point, the ALPHA that is disclosed by the Handel et al. reference is based upon <u>the temperature of the composite material</u>, but does not use <u>the integrated value</u> as recited by claim 1. That is, the claimed invention and the Handel et al. reference are different as follows:

The Handel et al. reference = (a certain timing)Temperature Data -> (this timing) Cure Condition (ALPHA).

The claimed invention = (a certain period) Temperature Data -> (this period) amount of heat -> (after this period) Cure Condition.

Therefore, the Handel et al. reference does not teach or suggest the features of the claimed invention including: 1) calculating temperature data indicating transition of a

temperature distribution of a coating target; 2) calculating the temperature data with a time lapse; 3) calculating an integrated value of an amount of heat applied to the coating; 4) calculating the integrated valued based upon the temperature data; and 5) estimating the dry state of the coating based upon the integrated value of the amount of heat applied to the coating. As explained above, these features are important for providing a highly precise estimation of the dry state of a coating on a coating target

Rather, and in stark contrast to the present invention, and just like the conventional systems and methods described above, the Handel et al. reference discloses a system that controls the curing time for a composite based upon a temperature profile.

The system disclosed by the Handel et al. reference does not teach or suggest an important aspect of the invention which is determining the dry state of a coating based upon an amount of heat applied to the coating.

Specifically, the Handel et al. reference discloses measuring process data every 30 seconds, calculating critical control variables based upon the measured process data and controlling the temperature of the autoclave based upon: 1) lag values; 2) resin heat; and 3) a predetermined schedule of autoclave temperatures. (Col. 3, lines 58 - 68).

The Handel et al. reference explains that software modules (executives) "determine the pressures and temperatures required for an optimal cure . . . issues control commands at 30 second intervals to the autoclave interface so that the state of the heater, cooler, automatic valves, vacuum pump and other process equipment can be changed . . . The commands indicate the temperature, pressure and vacuum settings needed to follow a prescribed cure." (Col. 6, lines 4 - 16).

The Handel et al. reference further explains that the "prescribed cure" is "a

temperature profile for the prescribed cure from a cure process model, which determines the proper temperature setting of the autoclave for a given time to produce the optimal cure of the part . . . The cure process model receives . . . current temperature readings of the autoclave and part and a time value [and] . . uses this information to determine the resin heat and the autoclave temperature setting needed to maintain the optimal cure profile."

In other words, the Handel et al. reference teaches controlling the system such that a prescribed <u>temperature profile</u> (i.e. temperatures with respect to time) is followed.

The Handel et al. reference clearly <u>does not</u> teach or suggest controlling a system based upon <u>an amount of heat applied to the part</u> as the present invention and, therefore, the Handel et al. reference clearly <u>does not</u> obtain the advantages of the present invention.

Further, the Handel et al. reference is directed to compensating for the affect that the heat generated by a polymerization reaction (i.e. resin heat) has upon the temperature and the ability to follow the temperature profile of the prescribed cure. The Handel et al. reference explains that the quantity of heat generated by the polymerization (resin heat) supplies heat to cure the part in addition to the heat that is provided by the autoclave. (Col. 3, lines 12 - 20).

The Handel et al. reference explains that prior art systems have not compensated for this resin heat and have, therefore, not been able to accurately prevent the temperature of the part from overshooting a desired temperature (see Fig. 2; and col. 6, line 47 - col. 7, line 5).

Specifically, the Handel et al. reference explains that their advantage is that "there is no part temperature overshoot when the cure is controlled according to this invention because the exothermal reaction is accounted for by the control." (Col. 7, lines 2 - 5).

Applicants respectfully warn the Examiner against failing to appreciate the important

distinctions between the amount of heat applied to a coating as recited by the claims and the resin heat that is disclosed by the Handel et al. reference.

The Handel et al. reference very clearly explains that the resin heat is defined as the heat that is generated by the exothermal polymerization reaction. The Handel et al. reference recognizes that this resin heat has an affect upon the temperature and, therefore, affects the ability of an autoclave to follow a temperature profile for a prescribed cure. The Handel et al. reference factors the affect that this resin heat has upon the temperature in order to more accurately follow the temperature profile for a prescribed cure.

In stark contrast, the present invention calculates the amount of heat that is applied to the coating in order to more accurately estimate a dry state of the coating. Calculating the heat that is applied to the coating more directly associates the amount of heat that is being applied directly to the characteristics of the coating, which, as a result, enables a highly precise estimate of the dry state of the coating.

Therefore, the Handel et al. reference very clearly does not teach or suggest calculating the amount of heat that is applied to a coating.

Further, the Handel et al. reference does not teach or suggest calculating temperature data indicating a transition of a temperature distribution of a coating target with time lapse as recited by the independent claims.

Indeed, the Handel et al. reference does not teach or suggest any temperature distribution at all, let alone a temperature distribution of a coating target, or temperature data that indicates a transition of that temperature distribution with a time lapse.

Moreover, since the Handel et al. reference very clearly does not teach or suggest calculating an integrated value of the amount of heat applied to a coating, the Handel et al.

reference very clearly <u>does not</u> teach or suggest <u>estimating a dry state based upon the integrated value of the amount of heat</u> as recited by the independent claims.

Applicant notes that the Examiner alleges that the fibers in the composite material described by the Handel et al. reference corresponds to the claimed coating target and that the resin corresponds to the coating.

The Examiner then alleges that the disclosure in the Handel et al. reference of measuring the temperatures of the part 26 using thermocouples 54 and 55 corresponds to the claimed feature of calculating temperature data indicating transition of a temperature distribution of the coating target with time lapse.

However, contrary to the Examiner's allegation, the disclosure of simply <u>measuring</u> the temperature of the part at different positions on the part does not correspond to a <u>calculation</u> of temperature data indicating transition of a temperature distribution of the coating target with time lapse. The Handel et al. reference discloses simply <u>measuring</u> the temperature, not <u>calculating</u> the temperature distribution or the amount of heat applied to the coating.

Further, the thermocouples 54 and 55 merely measure the temperature of the part and do not distinguish between a coating target versus a coating at all, let alone provide a temperature distribution of a coating target.

As mentioned above, the Examiner also alleges that the disclosure of the Handel et al. reference of "ALPHA" corresponds to the claimed calculating an integrated value of an amount of heat applied to the coating on the basis of the temperature data.

However, contrary to the Examiner's allegation and as mentioned above, the variable "ALPHA" does not indicate <u>any amount of heat</u> at all, let alone provide <u>an integrated value of</u>

an amount of heat, an integrated value of an amount of heat based on the temperature data indicating a temperature distribution, or an integrated value of an amount of heat based on the temperature data indicating a temperature distribution on a coating target.

Rather, the "ALPHA" variable that is disclosed by the Handel et al. reference is a "dimensionless measure of the progress of the reaction" that is a "ratio of resin cure reaction heat at time t to the total heat of reaction." The ALPHA ratio is used to determine the mode under which the system may determine an optimal temperature for the autoclave in order to follow a temperature profile for a prescribed cure (see Figure 10).

The ALPHA variable is only capable of indicating the degree with which the polymerization reaction is complete and bases the calculation of that ratio upon a calculation of a current reaction heat. Thus, the ALPHA variable is only related to the reaction heat and does not involve any calculation of the total amount of heat that is applied to the part.

In other words, the ALPHA variable is only used to determine the effect that the resin/reaction heat has upon the temperatures in the autoclave and, thereby, enables the system to adjust the mode of controlling the temperatures according to the stage of the resin reaction. (Col. 11, lines 35 - 56).

Applicant submits that the concept taught in the Handel et al. reference is completely different from the present invention.

Therefore, the Handel et al. reference does not teach or suggest each and every element of the claimed invention and the Examiner is respectfully requested to withdraw this rejection of claims 1-4 and 13-16.

III. FORMAL MATTERS AND CONCLUSION

The Office Action objects to the drawings. This Amendment encloses a replacement drawing sheet which corrects Figures 5 and 7. Applicant respectfully requests withdrawal of this objection.

In view of the foregoing amendments and remarks, Applicant respectfully submits that claims 1-20, all the claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 10/7/05

James E. Howard
Registration No. 39,715

MCGINN INTELLECTUAL PROPERTY LAW GROUP, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, Virginia 22182-3817
(703) 761-4100
Customer No. 21254

FIG. 5

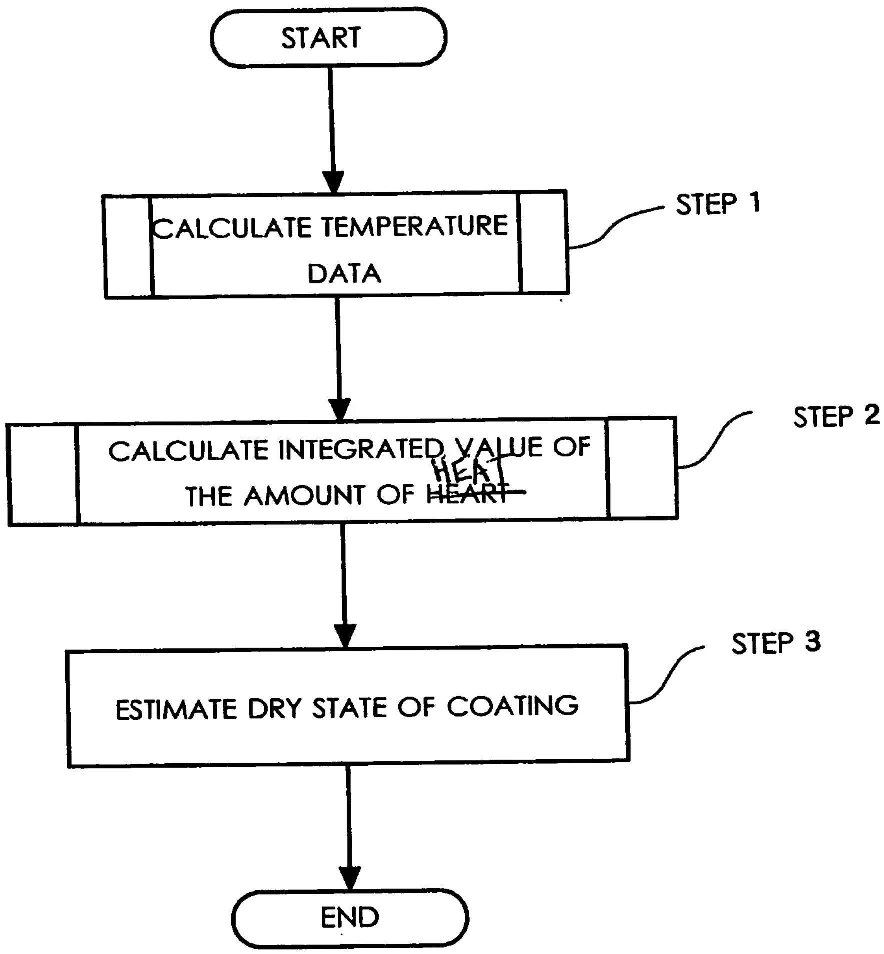
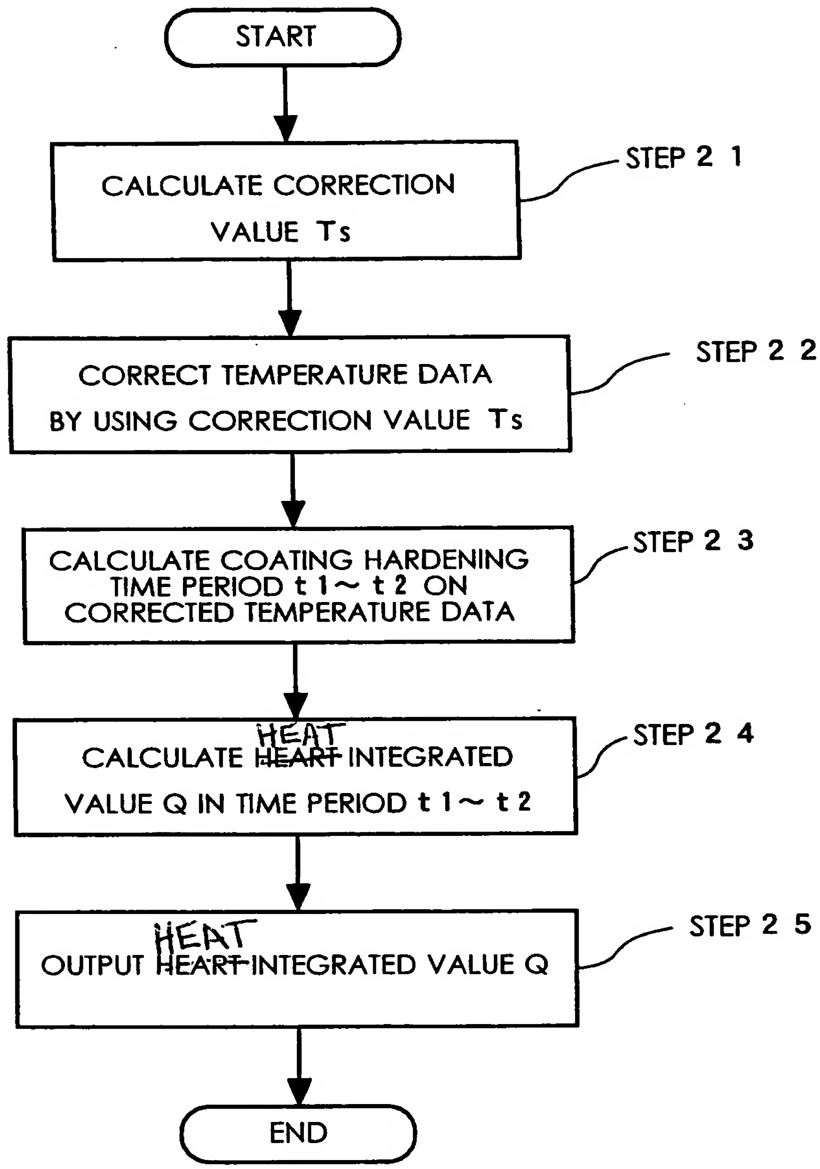

START
CALCULATE TEMPERATURE DATA
STEP 1
CALCULATE INTEGRATED VALUE OF THE AMOUNT OF ~~HEART~~ HEAT
STEP 2
ESTIMATE DRY STATE OF COATING
STEP 3
END

FIG. 7


START
CALCULATE CORRECTION VALUE Ts
STEP 2 1
CORRECT TEMPERATURE DATA BY USING CORRECTION VALUE Ts
STEP 2 2
CALCULATE COATING HARDENING TIME PERIOD t 1 ~ t 2 ON CORRECTED TEMPERATURE DATA
STEP 2 3
CALCULATE HEAT ~~HEART~~ INTEGRATED VALUE Q IN TIME PERIOD t 1 ~ t 2
STEP 2 4
OUTPUT HEAT ~~HEART~~ INTEGRATED VALUE Q
STEP 2 5
END